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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/716,016	11/16/2000	Steven T. Mayer	M-7125-2D US	7163

22434 7590 02/04/2004

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EXAMINER

LEADER, WILLIAM T

ART UNIT	PAPER NUMBER
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1742

DATE MAILED: 02/04/2004

17

Please find below and/or attached an Office communication concerning this application or proceeding.

AS-17

<b>Office Action Summary</b>	<b>Application No.</b> 09/719,016	<b>Applicant(s)</b> HAMILTON ET AL.	
	<b>Examiner</b> William T. Leader	<b>Art Unit</b> 1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 09 September 2003.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 19,21-25 and 29-40 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 25 and 29-39 is/are allowed.
- 6) ☒ Claim(s) 19,21,22 and 40 is/are rejected.
- 7) ☒ Claim(s) 23 and 24 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. §§ 119 and 120**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
     a) ☐ All    b) ☐ Some \* c) ☐ None of:  
         1. ☐ Certified copies of the priority documents have been received.  
         2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
         3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
     a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                  | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____                                    |

### DETAILED ACTION

1. Receipt of the papers filed on September 9, 2003, is acknowledged. New claim 40 has been presented. Claims 19, 21-25 and 29-40 are pending.
2. The Terminal Disclaimer has been entered. Consequently, the provisional rejection of claims 19, 21-25 and 29-39 under the judicially created doctrine of obviousness-type double patenting is deemed to have been overcome.
3. The amendments to claim 25 are deemed to have overcome the rejection of claims 25 and 29-35 under 35 U.S.C. 112, second paragraph.
4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

### *Claim Rejections - 35 USC § 103*

5. Claims 19, 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dubin (5,972,192) in view of the Condensed Chemical Dictionary and either of Lashmore (4,461,680) or Wright, Jr. (4,563,399) for the reasons of record and in view of the following comments.
6. At page 6 of the Remarks, applicant points out that the Lashmore and Wright patent do not concern deposition on a metal seed layer and quotes a portion of the specification describing the formation of a seed layer. In the rejection of record, it is the primary reference, Dubin et al, that is relied on to teach the

formation of and electrodeposition on a seed layer. The Dubin et al patent is directed to filling high aspect ratio openings by electrodepositing copper to form interconnects in the manufacture of integrated circuits on semiconductor wafers. This is the same field of endeavor to which applicant's invention is directed. As indicated at page 1, lines 17-20 of applicant's specification, "This invention relates to electroplating and, . . . most particularly to the electrochemical deposition of copper into microscopic recessed features such as high aspect ratio trenches and vias as may occur in the fabrication and packaging of integrated circuits." Dubin et al teach that a seed layer is required to carry electrical current for electroplating and observe that, for electroplating, the seed layer must be continuous (column 4, lines 19-21). Dubin et al disclose that the seed layer may be made of copper, thereby meeting the newly added limitation in claim 19. See example 3 where Dubin et al state that the initial electroplated copper increased the thickness of the copper seed layer. The function of the seed layer in the process of Dubin et al is the same as in applicant's process, i.e., to carry electric current to facilitate electroplating of copper onto the semiconductor workpiece. The Lashmore and Wright, Jr. patents have been applied to show that techniques which would aid in protecting the thin seed layer of Dubin et al from the highly corrosive sulfuric acid-containing copper electroplating bath are known in the art.

7. Claim 40 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dubin (5,972,192) in view of the Condensed Chemical Dictionary and either of Lashmore (4,461,680) or Wright, Jr. (4,563,399 as applied to claims 19, 21 and 22 above, and further in view of Ting et al (5,969,422).

8. New claim 40 recites that the metal seed layer is formed by a vapor deposition process. The Dubin et al patent does not disclose details of the formation of the copper seed layer. However, Dubin et al do refer to copending application 08/857,129, now Ting et al (5,969,422). The Ting et al patent is directed to the formation of interconnect structures in the manufacture of integrated circuits by electroplating copper. Ting et al disclose the use of a seed layer made of a copper alloy containing 0.5 to about 99.5 at. % copper (column 8, lines 13-18). The seed layer may be deposited by sputtering (a physical vapor deposition process) or CVD (chemical vapor deposition) to a suitable thickness of 300 to about 1000 angstroms (column 9, lines 8-10). It would have been obvious at the time the invention was made to have utilized a vapor deposition process to have deposited the seed layer in the process of Dubin et al because vapor deposition is suitable method for forming a seed layer as shown by Ting et al, and the Ting patent is specifically referred to by Dubin et al.

9. Claims 23 and 24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The prior art of record does not suggest the use of a copper reference electrode against which to measure cathodic voltage in the recited process of mitigating corrosion of a metal seed layer.

10. Claims 25, 29-39 allowed.

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will

the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William T. Leader whose telephone number is 571-272-1245. The examiner can normally be reached on Mondays-Thursdays and alternate Fridays, 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King, can be reached on 571-272-1244.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-1700.

*WL*  
William Leader  
January 21, 2004

ROY KING *R-1*  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700